

```
*****
;
; PROGRAM ID: DISK CONTROLLER MODULE
;
; VERSION: 2.2 8" RELEASE 2A
;
*****
;
; PRESENTED BY: JADE COMPUTER PRODUCTS INC.
; 4901 W. ROSECRANS BLVD.
; HAWTHORNE, CALIFORNIA
; 90250, U.S.A.
;
*****
;
; WRITTEN BY: STAN KRUMME
;
*****
; THE DISK CONTROLLER MODULE (DCM2) EXECUTES INTERNAL
; TO THE JADE DOUBLE D DISK CONTROLLER BOARD. THIS
; PROGRAM PROVIDES A FACILITY TO READ/WRITE DISKETTE
; SECTORS AND FORMAT DISKETTE TRACKS (IN SINGLE AND
; DOUBLE DENSITY). THIS DCM SETS THE PARAMETERS FOR
; EACH DRIVE DURING THE "LOG-ON" OPERATION. THE
; FORMAT.COM PROGRAM WRITES AN IDENTIFICATION SECTOR
; WHICH PROVIDES THE NEEDED INFORMATION. IF THIS
; IDENTITY SECTOR IS NOT PRESENT ON THE DISKETTE,
; IT IS ASSUMED TO BE A STANDARD 8" 3740 FORMAT.
; THIS PROGRAM CONTAINS A 4 WORD TIMING BLOCK WHICH
; SHOULD BE PATCHED TO MATCH THE USERS DISK DRIVES.
; THIS HAS NORMALLY BEEN SET FOR SHUGART SA800/801.
;
*****
;
; DISK CONTROLLER MODULE IS COMMAND COMPATABLE WITH
; THE FOLLOWING WESTERN DIGITAL CONTROLLER CHIPS.
; DOUBLE D USER SWITCH 0 (U0 OR R0) MUST BE SET TO
; INDICATE THE CONTROLLER CHIP DATA BUS POLARITY.
;
*****
; CONTROLLER IC USER SW0
; -----
; FD1791-02 (01) CLOSED
; FD1793-02 (01) OPENED
; FD1795-02 CLOSED
; FD1797-02 OPENED
;
*****
; THE FD1795-02 AND FD1797-02 PROVIDE ENHANCED SINGLE
; DENSITY PERFORMANCE IN THAT THESE CHIPS ARE FULLY
; COMPATABLE WITH FD1771-01 3740 FORMATS.
;
*****
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;*****
; THE FOLLOWING IS A LIST OF THE INTERNAL I/O ADDRESS *
; ASSIGNMENTS.  THESE PORTS AND CONTROLS CAN ONLY BE *
; USED BY THE ONBOARD Z80A.  THESE PORTS AND CONTROLS *
; ARE NOT IN THE S100 BUS ADDRESS SPACE.             *
;*****

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```

;***** ( CONTROLLER PORT ASSIGNMENTS )*****

```

```

0000      BL.STS  ==      000H      ;BOARD STATUS PORT.
0000      BL.CTL  ==      000H      ;BOARD CONTROL PORT.
0004      WD.CMD  ==      004H      ;179X COMMAND REGISTER.
0004      WD.STS  ==      004H      ;179X STATUS REGISTER.
0005      WD.TRK  ==      005H      ;179X TRACK REGISTER.
0006      WD.SEC  ==      006H      ;179X SECTOR REGISTER.
0007      WD.DTA  ==      007H      ;179X DATA REGISTER.

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;***** ( CONTROLLER FUNCTION ASSIGNMENTS )*****

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```

0008      XP.STP  ==      008H      ;ISSUE STEP PULSE.
0010      XP.MTO  ==      010H      ;MOTOR TURN OFF.
0020      XP.IRR  ==      020H      ;S100 INT-REQ RESET.
0040      XP.MTX  ==      040H      ;MOTOR TIME EXTEND.
0080      XP.DSH  ==      080H      ;DATA SYNC HOLD.

```

```

;*****
; THE FOLLOWING LIST ASSIGNS EACH BIT POSITION AND *
; FUNCTION OF THE BOARD CONTROL PORT (BL.CTL).      *
;*****

```

```

;***** ( BIT ASSIGNMENTS )*****

```

```

0001      BC.DSA  ==      00000001B  ;DRIVE SELECT A (2*0).
0002      BC.DSB  ==      00000010B  ;DRIVE SELECT B (2*1).
0004      BC.DSE  ==      00000100B  ;DRIVE SELECT ENABLE.
0008      BC.EIA  ==      00001000B  ;EIA SIGNAL LEVEL OUT.
0010      BC.DDE  ==      00010000B  ;DOUBLE DENSITY ENABLE.
0020      BC.DAS  ==      00100000B  ;DIRECTION AND SIDE
0040      BC.PCA  ==      01000000B  ;PRECOMP SELECT A.
0080      BC.PCB  ==      10000000B  ;PRECOMP SELECT B.

```

```

;***** ( FUNCTION ASSIGNMENTS )*****

```

```

0003      BC.DSN  ==      BC.DSA!BC.DSB  ;DRIVE NMBR MASK.
0000      BC.SDS  ==      0              ;SINGLE DENSITY.
0010      BC.DDS  ==      BC.DDE        ;DOUBLE DENSITY.
0040      BC.PCH  ==      BC.PCA        ;PRECOMP - HEAVY.
0080      BC.PCM  ==      BC.PCB        ;PRECOMP - MEDIUM.
00C0      BC.PCL  ==      BC.PCA!BC.PCB ;PRECOMP - LIGHT.
0020      BC.SD1  ==      BC.DAS        ;SELECT SIDE ONE.
0020      BC.INW  ==      BC.DAS        ;STEP INWARD DIRC.

```

```

;*****

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```

;*****
; THE FOLLOWING LIST DEFINES EACH BIT AND FUNCTION OF *
; THE BOARD STATUS PORT (BL.STS).
;*****

```

```

0001      BS.US0  ==  00000001B  ;USER SWITCH 0.
0002      BS.US1  ==  00000010B  ;USER SWITCH 1.
0004      BS.TST  ==  00000100B  ;TEST MODE SWITCH.
0008      BS.INT  ==  00001000B  ;HOST INT REQUEST.
0010      BS.EIA  ==  00010000B  ;EIA SIGNAL LEVEL IN.
0020      BS.MOF  ==  00100000B  ;MOTOR OFF INIDCATOR.
0040      BS.TSD  ==  01000000B  ;TWO SIDED DRIVE FLAG.
0080      BS.DCN  ==  10000000B  ;DISK CHANGE INDICATOR.

```

```

;*****
; THE FOLLOWING IS A LIST OF  COMMAND CODES ISSUED TO *
; THE 179X-02 DISK CONTROLLER.
;*****

```

```

0018      DC.HDL  ==  00011000B  ;SEEK/LOAD RW HEAD.
0010      DC.HDU  ==  00010000B  ;SEEK/UNLD RW HEAD.
0088      DC.RDS  ==  10001000B  ;READ SECTOR.
00A8      DC.WRS  ==  10101000B  ;WRITE SECTOR.
00F0      DC.WRT  ==  11110000B  ;WRITE TRACK FORMAT.
00C0      DC.RDA  ==  11000000B  ;READ TRACK ADDRESS.
00D0      DC.STS  ==  11010000B  ;SET TYPE 1 STATUS
00D8      DC.IFI  ==  11011000B  ;FORCED INTERRUPT.

```

```

;*****
; THE FOLLOWING LIST  CONTAINS ALL THE  MASKS USED TO *
; TEST THE 179X-02 STATUS CODES  (PORT WD.STS).
;*****

```

```

009D      DM.RER  ==  10011101B  ;READ ERROR TEST.
00FD      DM.WER  ==  11111101B  ;WRITE ERROR TEST.
00E4      DM.FER  ==  11100100B  ;FORMAT ERROR TEST.
0004      DM.TKO  ==  00000100B  ;TRACK 0 TEST.
0020      DM.HDL  ==  00100000B  ;HEAD LOAD TEST.
0080      DM.DNR  ==  10000000B  ;DRIVE NOT READY.
0004      DM.LDE  ==  00000100B  ;LOST DATA ERROR.

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;*****

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;*****
; THE FOLLOWING LIST DEFINES INTERNAL MEMORY.
;*****

;***** ( BASE ADDRESS FOR DCM )*****

1000      BASE      ==      1000H      ;BASE ADDRESS.

;***** ( MEMORY BANKS )*****

1000      BANK.0    ==      BASE+0000H      ;BANK 0 DEFINED.
0400      BANK.L    ==      0400H           ;BANK LENGTH.
1400      BANK.1    ==      BANK.0+BANK.L    ;BANK 1 DEFINED.

;***** ( RESTART VECTORS )*****

1000      RST.0     ==      BANK.0+0000H      ;RESTART 0.
1008      RST.1     ==      BANK.0+0008H      ;RESTART 1.
1010      RST.2     ==      BANK.0+0010H      ;RESTART 2.
1018      RST.3     ==      BANK.0+0018H      ;RESTART 3.
1020      RST.4     ==      BANK.0+0020H      ;RESTART 4.
1028      RST.5     ==      BANK.0+0028H      ;RESTART 5.
1030      RST.6     ==      BANK.0+0030H      ;RESTART 6.
1038      RST.7     ==      BANK.0+0038H      ;RESTART 7.

;***** ( INTERRUPT VECTORS )*****

1038      HR.INT    ==      RST.7             ;MASKABLE.
1066      NM.INT    ==      BANK.0+0066H      ;NON MASKABLE.

;***** ( I/O COMMUNICATION )*****

1370      IO.BLK    ==      BANK.0+0370H      ;I/O BLOCK BEGIN.
1370      TP.STK    ==      IO.BLK+0000H      ;TOP OF STACK.
1370      CMD.BK    ==      IO.BLK+0000H      ;COMMAND BLOCK.
1380      BUF.BG    ==      IO.BLK+0010H      ;SECTOR BUFFER.
1700      FMT.BG    ==      BANK.1+0300H      ;FORMAT BUFFER.
1708      FMT.PS    ==      FMT.BG+0008H      ;FORMAT PROGRAM.

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;*****

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;*****
; WAIT IS A "RESTART" TO THE TIMER SUBROUTINE ENTRY. *
; THIS SUBROUTINE PROVIDES MOST OF THE TIMING USED BY *
; THE DOUBLE D CONTROLLER. *
;*****

```

```

.DEFINE WAIT = [
    RST    1]

```

```

;*****
; ASSEMBLER DIRECTIVES *
;*****

```

```

.PABS           ;ABSOLUTE ADDRESSING.
.PHEX           ;INTEL HEX OBJECT FILE.
.XLINK          ;NO LINKAGE REQUIRED.

```

```

;*****
; TENTH MILLESECOND TIMING CONSTANTS / 0.2 MS FOR 5" *
;*****

```

```

0019          TMR.FC ==      0019H  ;TIMING CONSTANT, FIRST PASS.
001C          TMR.NC ==      001CH  ;TIMING CONSTANT, REPEAT PASS.

```

```

;*****
;          BAUD RATE GENERATOR - TIMING CONSTANTS *
;*****
;          BAUDRATE      US/BIT      8" SYS      5 " SYS *
;          -----      -
;          19200          52.1         9          N.A. *
;          9600           104.2        25          9 *
;          4800           208.3        57          25 *
;          2400           416.6       121          57 *
;          1200           833.3       248         121 *
;          600           1666.6      N.A.         248 *
;*****

```

```

0019          BAUD.C ==      25.      ;BAUD RATE CONSTANT 9600 8".

```

```

;*****
; ERROR RECOVERY VALUES *
;*****

```

```

0005          RTY.SK ==      5        ;REPOSITION R/W HEAD ON RETRY.
0009          RTY.LS ==      9        ;LAST REPEATED RETRY.

```

```

001A          TRK.OB ==      26        ;AT FIRST THIRD TRACK OF DISK.
0034          TRK.IB ==      52        ;AT SECOND THIRD TRACK.

```

```

;*****

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;*****
; THE FOLLOWING AREA IS THE INITIAL START JUMP TABLE. *
; THE FIRST JUMP IS EXECUTED WHEN THE ONBOARD Z80A IS *
; RESET. THE SECOND JUMP IS THE DCM ENTRY FROM A *
; BOOTSTRAP LOADER. THIS ENTRY ASSUMES DCM HAS BEEN *
; LOADED INTO DOUBLE D BANK 1 BY THE LOADER ROUTINE. *
; THE LAST TWO BYTES HOLD THE JUMP ADDRESS USED BY *
; RESTART INTERRUPT ROUTINE AT BANK 0 + 0380H. *
;*****

```

```

1000          .LOC    RST.0          ;MODULE BEGINNING.

1000      C3 0000          JMP      0          ;NOT IMPLEMENTED.
1003      C3 1780          JMP      INIT.B+BANK.L ;BOOTSTRAPPED ENTRY.
1006      1041      HR.VEC: .WORD    X.CUTE      ;HOST INTERRUPT VECTOR.

```

```

;*****
; THE FOLLOWING SUBROUTINE IS THE ENTRY POINT FOR THE *
; DISK CONTROLLER TIMING MODULE. THIS MODULE PROVIDES *
; DELAYS WHICH ARE MULTIPLES OF 100 MICROSECONDS. THE *
; CONTENTS OF REGISTER PAIR DE DETERMINES THE TOTAL *
; PERIOD. (DELAY = (DE )* 100 MICROSECONDS). THIS *
; SUBROUTINE IS ENTERED BY THE MACRO "WAIT". *
;*****

```

```

1008          .LOC    RST.1          ;TIMING ENTRY POINT.

1008      0619          MVI      B,TMR.FC      ;FIRST TICK CONSTANT.
100A      10FE          DJNZ     .            ;AUTO DEC UNTIL ZERO.
100C      C3 1074          JMP      TICK.E      ;JUMP TO TICK ENTRY.

```

```

;*****
; THE FOLLOWING SECTION IS THE DISK DRIVE TIMING AREA.*
; THE TIMES ARE SET FOR THE SHUGART SA800. THIS AREA *
; SHOULD BE MODIFIED FOR THE END USERS DRIVE TYPE. *
;*****

```

***** (TIMING VALUES IN 0.1 MS) *****

```

1010          .LOC    RST.2

1010      015E      TM.HLD: .WORD    350      ;HEAD ENGAGE TIME.
1012      0050      TM.STP: .WORD    80       ;STEPPER INTERVAL.
1014      0050      TM.ALS: .WORD    80       ;AFTER LAST STEP.
1016      0001      TM.MTO: .WORD    1        ;MOTOR START UP.

```

```

;*****

```

```

;*****
; THE FOLLOWING SUBROUTINE PROVIDES THE R/W HEAD CNTL *
; FUNCTION. AS THE FD179X-02 DOES NOT OFFER THIS *
; EXPLICIT COMMAND, THE SEEK COMMAND (TYPE-1) IS USED *
; WITH THE HEAD LOAD BIT SET / RESET. THE DESTINATION *
; TRACK IS SET EQUAL TO THE TRACK REGISTER TO BYPASS *
; THE FD179X-02 STEPPING FUNCTION. PLEASE REFER TO *
; THE FD179X-02 FLOW-CHART FOR TYPE-1 COMMANDS.      *
;*****

```

```

1018   FDE1      EX.HCF: POP      Y          ;RETURN ADDR IN REG Y.
101A   DB05      IN          WD.TRK        ;READ PRESENT TRACK.
101C   D307      OUT         WD.DTA        ;SET DESTINATION TRK.
101E   78        MOV        A,B          ;LOAD TYPE-1 COMMAND.
101F   A9        XRA         C            ;INVERT (1791-01).
1020   D304      OUT         WD.CMD        ;ISSUE COMMAND.
1022   18FE      JMPR       .             ;WAIT FOR INTERRUPT.

```

```

;*****
; THE FOLLOWING SUBROUTINE UPDATES THE FD179X-02 *
; STATUS PORT TO REFLECT CURRENT TYPE-1 STATUS CODES. *
; NOTE: THIS IS A TYPE-4 COMMAND WITH NO INTERRUPT *
; CONDITIONS SET.                                     *
;*****

```

```

1024   3ED0      EX.STS: MVI      A,DC.STS   ;LOAD SET-STATUS CMND.
1026   A9        XRA         C            ;INVERT (1791-01).
1027   D304      OUT         WD.CMD        ;ISSUE COMMAND.
1029   E3        XTHL        ;PAUSE FOR FD179X-02.
102A   E3        XTHL        ;PAUSE MORE.
102B   E3        XTHL        ;PAUSE STILL MORE.
102C   E3        XTHL        ;PAUSE LAST TIME.
102D   DB04      IN          WD.STS        ;INPUT STATUS PORT.
102F   A9        XRA         C            ;INVERT (1791-01).
1030   C9        RET          ;RETURN TO USER.

```

```

;*****
; THE FOLLOWING SECTION IS THE MASKABLE INTERRUPT *
; ROUTINE. THIS ROUTINE IS EXECUTED WHEN RESTARTING *
; THE Z80 FROM A HALT. THE FUNCTIONS ARE RESET THE *
; DOUBLE D INT REQ FLIP-FLOP, PUT THE INTERRUPTED *
; ADDR IN REG DE, AND JUMP ADDRESS AT "HR.VEC".      *
;*****

```

```

1038      .LOC      HR.INT          ;HOST INTERRUPT ADDR.
1038   DB20      IN          XP.IRR      ;RESET INTERRUPT REQ FF
103A   D1        POP        D          ;PURGE INTERRUPTED ADDR
103B   2A 1006    LHLD       HR.VEC      ;LOAD RETURN ADDRESS
103E   E9        PCHL        ;JUMP RETURN ADDRESS

```

```

;*****

```



```

; *****
; THE FOLLOWING SECTION HALTS EXECUTION OF THE
; ONBOARD Z80A PROCESSOR. DURING THIS TIME THE HOST
; SYSTEM CAN SWITCH THE CONTROLLER MEMORY INTO THE
; S100 BUS FOR STATUS CHECK, SETTING COMMAND BLOCK,
; AND SECTOR DATA TRANSFERS.
; *****

```

```

103F    FB    FETCH:  EI                ;ENABLE INTERRUPT START
1040    76    HLT                ;HALT ON-BOARD PROCESSOR

```

```

; *****
; THE FOLLOWING SECTION GAINS CONTROL AFTER THE DISK
; CONTROLLER IS INTERRUPTED FROM THE HALT CONDITION.
; THIS SECTION BRANCHES TO THE INDIVIDUAL COMMAND
; ROUTINES. THE COMMAND TABLE CONTAINS THE ADDRESSES
; FOR THIS DISTRIBUTION.
; *****

```

```

1041    3A 1370 X.CUTE: LDA      CB.CMD      ;LOAD HOST COMMAND.
1044    E607    ANI      CM.MSK      ;MASK ANY OPTIONS.
1046    87      ADD      A            ;GET 2*A VALUE.
1047    1600    MVI      D,0          ;ZERO D REGISTER.
1049    5F      MOV      E,A          ;DE NOW TABLE OFFSET.
104A    21 1053 LXI      H,CM.DTA      ;LOAD TABLE ADDRESS.
104D    19      DAD      D            ;NOW POINTS TO ENTRY.
104E    5E      MOV      E,M          ;LOW ORDER ADDR LOAD.
104F    23      INX      H            ;POINT TO NEXT BYTE.
1050    56      MOV      D,M          ;HI ORDER ADDRESS.
1051    EB      XCHG                ;BRANCH ADDR IN HL.
1052    E9      PCHL                ;BRANCH TO COMMAND.

```

```

; *****
; THE FOLLOWING AREA IS THE COMMAND DRIVER TABLE.
; EACH ENTRY POINTS TO THE COMMAND DRIVER ROUTINE.
; *****

```

```

1053    CM.DTA ==      .            ;COMMAND TABLE.

1053    10AC    ..CM0A: .WORD    $.LGON      ;LOG-ON DRIVE.
1055    107C    ..CM1A: .WORD    $.READ      ;READ SECTOR.
1057    108A    ..CM2A: .WORD    $.WRIT      ;WRITE SECTOR.
1059    1098    ..CM3A: .WORD    $.FORM      ;FORMAT TRACK.
105B    10C7    ..CM4A: .WORD    $.ADDR      ;READ ADDRESS.
105D    10CF    ..CM5A: .WORD    $.LIST      ;LIST OUTPUT.
105F    10D5    ..CM6A: .WORD    $.LSTT      ;LIST STATUS.
1061    10E4    ..CM7A: .WORD    $.IDLE      ;BACKGROUND.

0007    CM.MSK ==      007H          ;COMMAND MASK.

```

```

; *****

```

```

;*****
; THE FOLLOWING SECTION IS THE NON-MASKABLE INTERRUPT *
; ROUTINE. UPON 179X-02 COMMAND TERMINATION THE Z80 *
; RECIEVES A NON-MASKABLE INTERRUPT. THE STATUS PORT *
; IS INTERROGATED AND SAVED (SV.STS). REGISTER IY *
; CONTAINS THE RETURN ADDRESS. *
;*****

```

```

1066          .LOC      NM.INT          ;NON-MASKABLE INT.

1066  DB04      WD.INT: IN      WD.STS      ;GET 179X STATUS.
1068  A9        XRA      C              ;INVERT (1791).
1069  32 1334    STA      SV.STS      ;SAVE STATUS.
106C  FDE3      XTIY          ;EXCHANGE (SP)<>IY.
106E  ED45      RETN          ;RETURN AT OLD IY.

```

```

;*****
; THIS SECTION IS THE REMAINDER OF THE TIMING *
; SECTION ENTERED BY A RESTART 1. SEE THAT SECTION *
; FOR THE DESCRIPTION. *
;*****

```

```

1070  061C      TICK.R: MVI      B,TMR.NC      ;NORMAL TICK CONSTANT.
1072  10FE      DJNZ      .              ;AUTO DEC UNTIL ZERO.
1074  1B        TICK.E: DCX      D              ;DECREMENT AMOUNT.
1075  7A        MOV      A,D              ;GET HIGH ORDER.
1076  B3        ORA      E              ;AND LOW ORDER.
1077  00        NOP                      ;TIMING ADJUST.
1078  00        NOP                      ;TIMING ADJUST.
1079  20F5      JRNZ     TICK.R          ;REPEAT UNTIL ZERO.
107B  C9        RET                      ;RETURN TO USER.

```

```

;*****

```

```

; *****
; $.READ IS THE READ-SECTOR COMMAND CONTROLLER.      *
; *****

107C   CD 10EF   $.READ: CALL    SELECT      ;SELECT DRIVE ROUTINE.
107F   CD 1131           CALL    SEEK        ;SEEK TRACK, SET CTLS.
1082   2003           JRNZ     ..EXIT       ;DRIVE OR SEEK ERROR.
1084   CD 1204           CALL    RD.SEC      ;READ DISK SECTOR.
1087   C3 103F   ..EXIT: JMP     FETCH      ;GET NEXT COMMAND.

```

```

; *****
; $.WRIT IS THE WRITE-SECTOR COMMAND CONTROLLER.      *
; *****

108A   CD 10EF   $.WRIT: CALL    SELECT      ;SELECT DRIVE ROUTINE.
108D   CD 1131           CALL    SEEK        ;SEEK TRACK, SET CTLS.
1090   2003           JRNZ     ..EXIT       ;DRIVE OR SEEK ERROR.
1092   CD 122F           CALL    WR.SEC      ;WRITE DISK SECTOR.
1095   C3 103F   ..EXIT: JMP     FETCH      ;GET NEXT COMMAND.

```

```

; *****
; $.FORM IS THE FORMAT-TRACK COMMAND CONTROLLER.      *
; *****

1098   CD 10EF   $.FORM: CALL    SELECT      ;SELECT DRIVE NUMBER.
109B   3A 1373           LDA     CB.SEC      ;LOAD FORMAT FLAGS.
109E   DD7702           MOV     DV.FLG(X),A  ;RESET DRIVE FLAGS.
10A1   CD 1131           CALL    SEEK        ;SEEK TRACK, SET CTLS.
10A4   2003           JRNZ     ..EXIT       ;DRIVE OR SEEK ERROR.
10A6   CD 125A           CALL    WR.TRK      ;WRITE DISK TRACK.
10A9   C3 103F   ..EXIT: JMP     FETCH      ;GET NEXT COMMAND.

```

```

; *****
; $.LGON IS THE DRIVE LOG-ON COMMAND CONTROLLER      *
; *****

10AC   CD 10EF   $.LGON: CALL    SELECT      ;SELECT DRIVE NUMBER.
10AF   AF           XRA     A               ;ZERO REGISTER A.
10B0   32 1372           STA     CB.TRK      ;SET TRACK AT 0.
10B3   3C           INR     A               ;NOW A REG IS 1.
10B4   32 1373           STA     CB.SEC      ;SET SECTOR TO ID.
10B7   CD 1131           CALL    SEEK        ;SEEK TRACK, SET CTLS.
10BA   2008           JRNZ     ..EXIT       ;DRIVE OR SEEK ERROR.
10BC   CD 1204           CALL    RD.SEC      ;READ ID SECTOR.
10BF   2003           JRNZ     ..EXIT       ;READ ERROR DETECTED.
10C1   CD 12D7           CALL    LOG.ON      ;LOG ON DISK DRIVE.
10C4   C3 103F   ..EXIT: JMP     FETCH      ;GET NEXT COMMAND.

```

```

; *****

```

```

;*****
; $.ADDR IS THE READ-ADDRESS COMMAND CONTROLLER.      *
;*****

10C7    3EFF    $.ADDR: MVI    A,OFFH    ;LOAD ALL ONES.
10C9    32 1377    STA    CB.STS    ;STORE ERRORS.
10CC    C3 103F    JMP    FETCH    ;NOT IMPLEMENTED.

;*****
; $.LIST IS A LIST DEVICE COMMAND CONTROLLER.          *
;*****

10CF    CD 12F4    $.LIST: CALL    LST.OT    ;SEND CHAR TO LIST.
10D2    C3 103F    JMP    FETCH    ;GET NEXT COMMAND.

;*****
; $.LSTT CHECKS LIST DEVICE STATUS                      *
;*****

10D5    DB00    $.LSTT: IN    BL.STS    ;GET BOARD STATUS.
10D7    E610    ANI    BS.EIA    ;TEST READY BIT.
10D9    CA 10DE    JZ    ..EXIT    ;IF ZERO GOTO EXIT.
10DC    3EFF    MVI    A,OFFH    ;LOAD ALL ONES.
10DE    32 1377    ..EXIT: STA    CB.STS    ;STORE STATUS.
10E1    C3 103F    JMP    FETCH    ;GET NEXT COMMAND.

;*****
; $.IDLE IS THE IDLE COMMAND CONTROLLER.                *
;*****

10E4    DB00    $.IDLE: IN    BL.STS    ;INPUT BOARD STATUS.
10E6    E608    ANI    BS.INT    ;CHECK HOST INTERRUPT.
10E8    28FA    JRZ    $.IDLE    ;REPEAT IDLE CHECK.
10EA    DB20    IN    XP.IRR    ;RESET INTERRUPT REQ.
10EC    C3 103F    JMP    FETCH    ;GET NEXT COMMAND.

;*****

```

```

;*****
; THE FOLLOWING SUBROUTINE SELECTS REQUESTED DRIVE *
; NUMBER 0-3 (A-D). BEFORE DRIVE SELECTION, THE DRIVE *
; MOTOR CONTROL STATE IS TESTED AND ENABLED IF NEEDED.*
; INDEX REGISTER X IS SET POINTING TO THE REQUESTED *
; DRIVE TABLE ENTRY. THE DRIVE IS THEN SELECTED.      *
;*****

```

```

;***** ( MOTOR CHECK ROUTINE ) *****

```

```

10EF    DB00      SELECT: IN      BL.STS      ;BOARD LEVEL STATUS.
10F1    E620              ANI      BS.MOF      ;CHECK MOTOR STATE.
10F3    DB40              IN      XP.MTX      ;START OR EXTEND TIMER.
10F5    2805              JRZ      ..CKDV      ;IF WAS ON, NO STARTUP.
10F7    ED5B 1016      LDDE      TM.MTO      ;MOTOR STARTUP DELAY.
10FB    CF              WAIT              ;PROGRAMMABLE DELAY.

```

```

;***** ( NEW SELECTION CHECK ) *****

```

```

10FC    3A 1371      ..CKDV: LDA      CB.DRV      ;LOAD DRIVE NUMBER.
10FF    E603              ANI      BC.DSN      ;GET DRIVE NUMBER.
1101    DDBE00        CMP      DV.NBR(X)      ;CURRENTLY SELECTED?
1104    C8              RZ                  ;RETURN IF DRV SAME.

```

```

;***** ( SET TABLE POINTER ) *****

```

```

1105    DD21 1342      LXI      X,DV.TBL      ;DRIVE TABLE ADDR.
1109    11 0004      LXI      D,DV.DES      ;DRIVE ENTRY SIZE.
110C    3D      ..NEXT: DCR      A          ;DECREMENT DRV NO.
110D    FA 1114      JM      ..DSLTT      ;IF S=1 EXIT.
1110    DD19      DADX      D          ;POINT NEXT DRIVE.
1112    18F8      JMPR      ..NEXT      ;TRY THIS DRIVE.

```

```

;***** ( DESELECT OLD DRIVE ) *****

```

```

1114    0610      ..DSLTT: MVI      B,DC.HDU      ;LOAD UNLOAD R/W HEAD.
1116    CD 1018      CALL      EX.HCF      ;FD179X-02 TYPE 1 CMND.
1119    3A 1333      LDA      SV.CTL      ;BL.CTL LAST ISSUED.
111C    E6FB      ANI      #BC.DSE      ;DRIVE SELECT DSBLD.
111E    D300      OUT      BL.CTL      ;ISSUE DESELECT.

```

```

;***** ( SELECT NEW DRIVE ) *****

```

```

1120    E6FC      ANI      #BC.DSN      ;STRIP OFF DRIVE NMBR.
1122    DDB600      ORA      DV.NBR(X)      ;OR IN NEW DRIVE NMBR.
1125    D300      OUT      BL.CTL      ;OUTPUT DRIVE NMBR.
1127    F604      ORI      BC.DSE      ;SET DRV ENABLE BIT.
1129    D300      OUT      BL.CTL      ;ENABLE NEW DRIVE.
112B    E607      ANI      BC.DSN!BC.DSE      ;NOW JUST DRIVE ENBLED.
112D    32 1331      STA      SV.DRV      ;SAVE DRIVE SELECT.
1130    C9      RET                  ;DRIVE IS SELECTED.

```

```

;*****

```



```

;*****
; THE FOLLOWING SUBROUTINE PERFORMS THE TRACK SEEK *
; OPERATION. AFTER THE SEEK OPERATION, THE DENSITY *
; AND PRE-COMPENSATION CONTROLS ARE SET. *
;*****

;***** ( HEAD LOADING )*****

1131 CD 1024      SEEK:  CALL    EX.STS      ;GET DRIVE STATUS.
1134 E6A0        ANI     DM.HDL!DM.DNR    ;CHECK HEAD AND READY.
1136 FA 1174     JM      ..NRDY          ;DRIVE NOT READY EXIT.
1139 C2 1146     JNZ     ..DTAS          ;BYPASS IF HEAD LOADED.
113C 0618        MVI     B,DC.HDL        ;HEAD-LOAD COMMAND.
113E CD 1018     CALL    EX.HCF          ;EXEC FD179X-02 TYPE 1.
1141 ED5B 1010   LDED     TM.HLD          ;SET HEAD-LOAD DELAY.
1145 CF          WAIT                    ;PROGRAMMABLE DELAY.

;***** ( DETERMINE TRACK NMBR AND SIDE )*****

1146 DB00        ..DTAS: IN      BL.STS      ;INPUT BOARD STATUS.
1148 E640        ANI     BS.TSD          ;TEST DISK SIDES FLAG.
114A 3A 1372     LDA     CB.TRK          ;GET LOGICAL TRACK NO.
114D 6F          MOV     L,A            ;SAVE LOGICAL TRACK.
114E C2 1152     JNZ     ..NDBL          ;SKIP IF NOT DBL SIDED.
1151 1F          RAR                      ;DIV BY 2 DOUBLE SIDE.
1152 32 1335     ..NDBL: STA     PH.TRK     ;STORE PHYSICAL TRACK.
1155 67          MOV     H,A            ;SAVE PHYSICAL NUMBER.
1156 3A 1331     LDA     SV.DRV          ;LOAD DRV NMBR ENABLED.
1159 3002        JRNC    ..SIDO          ;SKIP NEXT IF SIDE 0.
115B F620        ORI     BC.SD1         ;OR IN SELECT SIDE 1.
115D 32 1332     ..SIDO: STA     SV.DAS     ;STORE DRV AND SIDE EN.
1160 57          MOV     D,A            ;SAVE DRV AND SIDE EN.
1161 7C          MOV     A,H            ;LOAD PHYSICAL NUMBER.
1162 DD9601      SUB     DV.TRK(X)       ;TRACK OFFSET TESTED.
1165 2021        JRNZ    ..SEEK          ;IF OFFTRACK, DO SEEK.
1167 DB00        IN      BL.STS          ;INPUT BOARD STATUS.
1169 E640        ANI     BS.TSD          ;TEST DISK SIDES FLAG
116B CA 117B     JZ      ..DSID          ;GOTO DOUBLE SIDE CTL.

;***** ( SINGLE SIDED DISKETTE )*****

116E DD7E03      ..SSID: MOV     A,DV.CTL(X) ;GET PREVIOUS CONTROLS.
1171 C3 11EA     JMP     ..EXIT          ;SET CONTROLS / EXIT.

;***** ( DRIVE NOT READY EXIT )*****

1174 3E80        ..NRDY: MVI     A,CS.DNR ;DRIVE NOT READY FLAG.
1176 32 1377     STA     CB.STS          ;STORE ERROR STATUS.
1179 A7          ANA     A              ;SET NOT ZERO FLAG.
117A C9          RET                    ;ERROR EXIT.

;*****

```

***** (DISKETTE IS DOUBLE SIDED) *****

117B	7C	..DSID:	MOV	A,H	;GET PHYSICAL TRK NMBR.
117C	A7		ANA	A	;TEST IF TRACK ZERO.
117D	283B		JRZ	..DCTL	;IF ZERO, RESET CNTLS.
117F	DD7E03		MOV	A,DV.CTL(X)	;LOAD OLD DRV CTLS.
1182	E6DF		ANI	#BC.SD1	;STRIP OFF SIDE CMND.
1184	B2		ORA	D	;OR IN NEW SIDE CMND.
1185	C3 11EA		JMP	..EXIT	;SET CONTROLS / EXIT.

***** (SET DIRECTION AND COUNT STEPS) *****

1188	F5	..SEEK:	PUSH	PSW	;SAVE REG A AND FLGS.
1189	ED5B 1338		LDDE	TM.SAW	;STEP AFTER WRITE.
118D	CF		WAIT		;PROGRAMMABLE DELAY.
118E	F1		POP	PSW	;RESTORE A AND FLGS.
118F	380A		JRC	..SOUT	;IF CARRY STEP OUT.
1191	6F	..SIN:	MOV	L,A	;MOVE OFFSET TO L.
1192	3A 1331		LDA	SV.DRV	;DRIVE SELECT BITS.
1195	F620		ORI	BC.INW	;SET STEP DIRC IN.
1197	D300		OUT	BL.CTL	;OUTPUT CONTROL.
1199	180B		JMPR	..STEP	;GOTO STEP ROUTINE.
119B	ED44	..SOUT:	NEG		;COMPLEMENT OFFSET.
119D	FA 11FD		JM	..HOME	;BETTER HOME DRV.
11A0	6F		MOV	L,A	;MOVE OFFSET TO L.
11A1	3A 1331		LDA	SV.DRV	;DRIVE SELECT BITS.
11A4	D300		OUT	BL.CTL	;SET DIRECTION OUT.
11A6	DB08	..STEP:	IN	XP.STP	;ISSUE STEP PULSE.
11A8	ED5B 1012		LDDE	TM.STP	;STEP DELAY TIME.
11AC	CF		WAIT		;PROGRAMMABLE DELAY.
11AD	2D		DCR	L	;DECREMENT STEPS.
11AE	20F6		JRNZ	..STEP	;REPEAT OPERATION.
11B0	3A 1332		LDA	SV.DAS	;LOAD DRV AND SIDE.
11B3	D300		OUT	BL.CTL	;OUTPUT CONTROL.
11B5	ED5B 1014		LDDE	TM.ALS	;MORE AFTER LAST STP.
11B9	CF		WAIT		;PROGRAMMABLE DELAY.

***** (CONTROL DETERMINATION)*****

```

11BA 3A 1372    ..DCTL: LDA    CB.TRK    ;LOAD LOGICAL TRACK.
11BD FE01      CPI    1                ;COMPARE AGAINST 1.
11BF 3820      JRC    ..SDEN           ;TRACK 0 IS SDENS.
11C1 3E04      MVI    A,DF.DTD         ;DATA TRK DENS FLG.
11C3 C2 11C8    JNZ    ..DTST          ;GOTO TEST DENSITY.
11C6 3E02      MVI    A,DF.T1D         ;TRACK 1 DENS FLAG.
11C8 DDA602    ..DTST: ANA    DV.FLG(X) ;TEST DENSITY FLAGS.
11CB CA 11E1    JZ     ..SDEN           ;IF ZERO, THEN SDENS.
11CE 3A 1335    ..DDEN: LDA    PH.TRK    ;LOAD PHYSICAL TRACK.
11D1 FE1A      CPI    TRK.OB           ;TEST OUTSIDE BOUNDRY.
11D3 06D0      MVI    B,BC.DDS!BC.PCL ;DDENS AND LOW PRECOMP.
11D5 380C      JRC    ..CTL5           ;SET FOR OUTSIDE TRKS.
11D7 FE34      CPI    TRK.IB           ;TEST INSIDE BOUNDRY.
11D9 0690      MVI    B,BC.DDS!BC.PCM ;DDENS AND MED PRECOMP.
11DB 3806      JRC    ..CTL5           ;JUMP TO CONTROLS SET.
11DD 0650      MVI    B,BC.DDS!BC.PCH ;DDENS AND MAX PRECOMP.
11DF 1802      JMPR   ..CTL5           ;JUMP TO CONTROLS SET.

```

```

11E1 06C0      ..SDEN: MVI    B,BC.SDS!BC.PCL ;SDEN AND PC-LOW.

```

***** (SET CONTROL VALUES AND EXIT)*****

```

11E3 3A 1332    ..CTL5: LDA    SV.DAS    ;GET DRIVE AND SIDE.
11E6 B0        ORA    B                ;SET PRECOMP AND DENS.
11E7 DD7703     MOV    DV.CTL(X),A       ;SAVE CONTROLS FOR DRV.
11EA D300      ..EXIT: OUT    BL.CTL     ;OUTPUT CONTROLS.
11EC 32 1333    STA    SV.CTL           ;SAVE THESE CONTROLS.
11EF 3A 1335    LDA    PH.TRK           ;PHYSICAL TRACK NMBR.
11F2 DD7701     MOV    DV.TRK(X),A       ;SET DRIVE TABLE.
11F5 3A 1372    LDA    CB.TRK           ;LOGICAL TRACK NMBR.
11F8 A9        XRA    C                ;INVERT (1791-01).
11F9 D305      OUT    WD.TRK           ;SET TRACK REGISTER.
11FB AF        XRA    A                ;SET ZERO FLAG.
11FC C9        RET                     ;RETURN TO CALLER.

```

***** (CALIBRATE TRACK NUMBER)*****

```

11FD CD 12A6    ..HOME: CALL    HOME.D    ;HOME SELECTED DRIVE.
1200 C0        RNZ                     ;EXIT SEEK, HOME BAD.
1201 C3 1146    JMP     ..DTAS          ;NOW SEEK TRACK.

```

```

;*****
; RD.SEC IS THE SUBROUTINE THAT INTERACTS WITH THE *
; 179X-02 DURING READ SECTOR OPERATIONS. THIS SECTION *
; INITIATES THE DISK TRANSFER, SERVICES THE CONTROLLER*
; CHIP DURING DATA TRANSFER, AND TERMINATES OPERATION *
; WHEN FINISHED. ERROR DETECTION IS IMPLEMENTED AND *
; RETRIES ARE EXRCUTED IF DATA ERRORS ARE DETECTED. *
;*****

;***** ( INITIALIZE READ OPERATION )*****

1204 AF RD.SEC: XRA A ;ZERO A REGISTER.
1205 32 1330 STA ERR.CT ;ZERO ERROR COUNT.
1208 3A 1373 LDA CB.SEC ;LOAD SECTOR NMBR.
120B A9 XRA C ;INVERT (1791-01).
120C D306 OUT WD.SEC ;SET SECTOR REGISTER.
120E FD21 1223 ..RTRY: LXI Y,..NMI ;LOAD NMI VECTOR.
1212 2A 132E LHLD BUF.ST ;BUFFER START.
1215 3E88 MVI A,DC.RDS ;READ SECTOR COMMAND.
1217 A9 XRA C ;INVERT (1791-01).
1218 D304 OUT WD.CMD ;ISSUE READ COMMAND

;***** ( DATA TRANSFER LOOP )*****

121A DB80 ..REPT: IN XP.DSH ;HOLD FOR DATA
121C DB07 IN WD.DTA ;INPUT DATA.
121E A9 XRA C ;INVERT (1791-01).
121F 77 MOV M,A ;PUT INTO BUFFER
1220 23 INX H ;BUMP BUFF POINTER
1221 18F7 JMPR ..REPT ;GO FOR ANOTHER

;***** ( CHECK STATUS )*****

1223 E69D ..NMI: ANI DM.RER ;TEST FOR ERRORS.
1225 32 1377 STA CB.STS ;SAVE READ STATUS.
1228 C8 RZ ;RETURN COMPLETE.
1229 CD 1279 CALL CHK.RT ;CHECK ABOUT RETRYS.
122C 28E0 JRZ ..RTRY ;PERFORM RETRY.
122E C9 RET ;ERROR RETURN.

;*****

```

```

;*****
; WR.SEC SUBROUTINE INTERACTS WITH THE FD179X-02 *
; DURING WRITE SECTOR OPERATIONS. THIS SECTION *
; INITIATES THE DISK TRANSFER, SERVICES THE CONTROLLER*
; CHIP, AND TERMINATES THE OPERATION. ERROR DETECTION *
; IS IMPLEMENTED. *
;*****

;***** ( INITIALIZE WRITE OPERATION )*****

122F AF WR.SEC: XRA A ;ZERO REGISTER.
1230 32 1330 STA ERR.CT ;SET ERROR COUNTER.
1233 3A 1373 LDA CB.SEC ;LOAD SECTOR NMBR.
1236 A9 XRA C ;INVERT (1791-01).
1237 D306 OUT WD.SEC ;SET SECTOR REGISTER.
1239 FD21 124E ..RTRY: LXI Y,..NMI ;SET NMI RETURN.
123D 2A 132E LHLD BUF.ST ;BUFFER START.
1240 3EA8 MVI A,DC.WRS ;LOAD WRITE SECTOR CMD.
1242 A9 XRA C ;INVERT (1791-01).
1243 D304 OUT WD.CMD ;ISSUE COMMAND.

;***** ( DATA TRANSFER LOOP )*****

1245 DB80 ..REPT: IN XP.DSH ;HOLD FOR DATA REQ.
1247 7E MOV A,M ;GET DATA BYTE.
1248 A9 XRA C ;INVERT (1791-01).
1249 D307 OUT WD.DTA ;OUTPUT DATA BYTE.
124B 23 INX H ;INCREMENT BUFF POINTER
124C 18F7 JMPR ..REPT ;REPEAT SEQUECE

;***** ( CHECK STATUS )*****

124E E6FD ..NMI: ANI DM.WER ;TEST FOR WRITE ERRORS.
1250 32 1377 STA CB.STS ;STORE WRITE STATUS.
1253 C8 RZ ;RETURN COMPLETE.
1254 CD 1279 CALL CHK.RT ;CHECK ABOUT RETRYS.
1257 28E0 JRZ ..RTRY ;PERFORM RETRY.
1259 C9 RET ;ERROR RETURN.

;*****

```



```
*****
; WR.TRK IS THE SUBROUTINE WHICH INITIATES A FORMAT *
; TRACK COMMAND (WRITE-TRACK 179X-02 TYPE 3). THE *
; FORMATTING BYTE STREAM IS PROVIDED BY A PROGRAM *
; WHICH MUST BE PRESENT IN THE FORMAT BUFFER. *
*****
```

```
***** ( INITIALIZE WRITE TRACK )*****
```

```
125A    FD21 1266    WR.TRK: LXI      Y,..NMI      ;LOAD NMI VECTOR.
125E    3EF0                MVI      A,DC.WRT      ;WRITE TRACK CMND.
1260    A9                XRA      C              ;INVERT (1791-01).
1261    D304                OUT     WD.CMD         ;ISSUE COMMAND.
1263    C3 1708                JMP     FMT.PS       ;FORMAT PROG START.
```

```
***** ( CHECK COMPLETION STATUS )*****
```

```
1266    E6E4    ..NMI: ANI      DM.FER      ;TEST FOR ERRORS.
1268    47                MOV     B,A        ;HOLD THIS STATUS.
1269    DB00                IN      BL.STS     ;INPUT BOARD STATUS.
126B    E640                ANI      BS.TSD     ;TEST TWO SIDED BIT.
126D    78                MOV     A,B        ;RESTORE STATUS TO A.
126E    2002                JRNZ    ..EXIT     ;NOT ZERO IS ONE SIDED.
1270    F601                ORI      CS.TSD     ;OR IN TWO SIDED FLAG.
1272    32 1377    ..EXIT: STA     CB.STS     ;STORE FORMAT STATUS.
1275    22 137A                SHLD   CW.LNG     ;DISPLAY TRAIL BYTES.
1278    C9                RET                ;RETURN TO USER.
```

```
*****
```

```

;*****
; CHK.RT IS THE SUBROUTINE USED BY RD.SEC AND
; WR.SEC TO COUNT RETRY OPERATIONS AND PERFORM A
; RE-SEEK OPERATION WHEN NEEDED.
;*****

```

```

;***** ( CHECK IF RECOVERABLE )*****

```

```

1279 E680 (HK.RT: ANI DM.DNR ;TEST NOT READY BIT.
127B 2028 JRNZ ..EXIT ;CAN NOT RECOVER.
127D 3A 1376 LDA CB.MOD ;GET COMMAND MODE.
1280 E680 ANI CM.NRT ;NO RETRYS CHECK.
1282 2021 JRNZ ..EXIT ;SHOULD NOT RECOVER.
1284 DB40 IN XP.MTX ;MOTOR TIME EXTEND.

```

```

;***** ( RECORD RETRY )*****

```

```

1286 3A 1330 LDA ERR.CT ;GET ERROR COUNT.
1287 3C INR A ;INCREMENT.
128A 32 1330 STA ERR.CT ;STORE NEW COUNT.
128D FE05 CPI RTY.SK ;SHOULD TRY SEEK?
128F 2008 JRNZ ..CKLS ;IF NOT, CHECK LAST.

```

```

;***** ( REPOSITION R/W HEAD )*****

```

```

1291 CD 12A6 CALL HOME.D ;HOME SELECTED DRIVE.
1294 200F JRNZ ..EXIT ;ERROR EXIT.
1296 CD 1131 CALL SEEK ;SEEK DESIRED TRACK.

```

```

;***** ( HOLD READ GATE FOR 3/4 REVOLUTION )*****

```

```

1299 FE09 ..CKLS: CPI RTY.LS ;WAS THIS THE LAST.
129B 2807 JRZ ..STNZ ;ERROR LAST RETRY.
129D ED5B 1336 LDED TM.PLD ;PHASE LOCK DELAY.
12A1 CF WAIT ;PROGRAMMABLE DELAY.
12A2 AF XRA A ;CLEAR FOR RETRY.
12A3 C9 RET ;TRY AGAIN EXIT.

```

```

;***** ( ERROR EXIT )*****

```

```

12A4 3C ..STNZ: INR A ;SET NOT ZERO.
12A5 C9 ..EXIT: RET ;ERROR EXIT.

```

```

;*****

```

```

;*****
; HOME.D IS THE SUBROUTINE THAT STEPS THE DISK DRIVE *
; R/W HEAD OUTWARD UNTIL THE TRACK 0 FLAG BECOMES *
; ACTIVE OR 255 STEPS HAVE BEEN ISSUED. *
;*****

```

```

;***** ( RESTORE R/W HEAD )*****

```

```

12A6      3A 1331      HOME.D: LDA      SV.DRV      ;LOAD DRV NMBR ENABLED.
12A9      D300          OUT      BL.CTL      ;ISSUE CONTROLS.
12AB      32 1333          STA      SV.CTL      ;AND SAVE THESE.
12AE      2EFF          MVI      L,255      ;SET STEP COUNTER.
12B0      CD 1024      ..STEP: CALL    EX.STS      ;CHECK DISK STATUS.
12B3      E604          ANI      DM.TK0      ;INSPECT TRACK 0 FLG.
12B5      200C          JRNZ     ..EXIT      ;IF SET, GO ..EXIT.
12B7      2D           DCR      L           ;DECREMENT STEP COUNT.
12B8      2814          JRZ      ..EROR      ;ERROR IF 255 STEPS.
12BA      DB08          IN       XP.STP      ;ISSUE STEP PULSE.
12BC      ED5B 1012     LD      TM.STP      ;LOAD STEP DELAY.
12C0      CF           WAIT     ;PROGRAMMABLE DELAY.
12C1      18ED          JMPR     ..STEP      ;TRY STEPPING AGAIN.

```

```

;***** ( DRIVE IS RESTORED )*****

```

```

12C3      ED5B 1014     ..EXIT: LD      TM.ALS      ;TIME AFTER LAST STEP.
12C7      CF           WAIT     ;PROGRAMMABLE DELAY.
12C8      79           MOV      A,C           ;GET WD TRK 0 VALUE.
12C9      D305          OUT      WD.TRK      ;ZERO TRACK REGISTER.
12CB      AF           XRA      A           ;ZERO A REG, SET FLAG.
12CC      DD7701        MOV      DV.TRK(X),A      ;SET TRACK VALUE.
12CF      C9           RET      ;RETURN TO CALLER.

```

```

;***** ( TRACK 0 NOT FOUND )*****

```

```

12D0      3E02      ..EROR: MVI      A,CS.HME      ;LOAD HOME ERROR FLAG.
12D2      32 1377      STA      CB.STS      ;STORE ERROR STATUS.
12D5      A7          ANA      A           ;SET RETURN FLAGS.
12D6      C9          RET      ;RETURN TO CALLER.

```

```

;*****

```

```

;*****
; LOG.ON IS THE SUBROUTINE THAT READS THE IDENTITY *
; SECTOR FROM THE DISKETTE AND MAKES THE NEEDED *
; ENTRIES INTO THE DRIVE TABLE. THE SECTOR DATA IS *
; ALSO LEFT IN THE SECTOR BUFFER FOR BIOS TO FINISH *
; THE LOG-ON OPERATION. *
;*****

;***** ( CHECK JADE IDENTITY )*****

12D7 11 133A LOG.ON: LXI D,JADEID ;ID ADDRESS LOADED.
12DA 21 1380 LXI H,ID.LBL ;SECTOR ID ADDRESS.
12DD 0608 MVI B,ID.SZE ;ID LABEL SIZE.
12DF 1A ..CKJI: LDAX D ;GET CHARACTER.
12E0 BE CMP M ;CHECK AGAINST DISK.
12E1 200B JRNZ ..3740 ;IF DIFFERENT: 3740.
12E3 13 INX D ;CHECK NEXT.
12E4 23 INX H ;CHECK NEXT.
12E5 10F8 DJNZ ..CKJI ;REPEAT OPERATION.

;***** ( LOG-ON JADE FORMAT )*****

12E7 3A 13B1 LDA ID.FLG ;SIDE AND DENSITIES.
12EA DD7702 MOV DV.FLG(X),A ;STORE IN DRIVE TBL.
12ED C9 RET ;RETURN TO CALLER.

;***** ( ASSUME 3740 FORMAT )*****

12EE 3E00 ..3740: MVI A,ID.FLD ;SIDE AND DENSITIES.
12F0 DD7702 MOV DV.FLG(X),A ;STORE IN DRIVE TBL.
12F3 C9 RET ;RETURN TO CALLER.

;*****

```

```

;*****
; THE FOLLOWING ROUTINE SENDS ONE 8 BIT CHARACTER OUT *
; THE EIA LEVEL TRANSMISSION BIT.  SET FOR BAUD RATE. *
;*****

```

```

;***** ( SET UP FOR TRANSMISSION ) *****

```

12F4	DB00	LST.OT:	IN	BL.STS	;GET BOARD STATUS.
12F6	E610		ANI	BS.EIA	;TEST LIST READY BIT.
12F8	CA 12F4		JZ	LST.OT	;WAIT READY (JZ/JNZ).
12FB	3A 1375		LDA	CB.CHR	;GET LIST CHARACTER.
12FE	2F		CMA		;COMPLEMENT ACUMULATOR.
12FF	5F		MOV	E,A	;CHARACTER TO E REG.
1300	3A 1333		LDA	SV.CTL	;LAST CONTROLS USED.

```

;***** ( SEND THE START BIT ) *****

```

1303	37		STC		;SET CARRY BIT.
1304	CD 131A		CALL	BIT.OT	;OUTPUT START BIT.
1307	00		NOP		;EQUALIZE TIMING.
1308	00		NOP		;EQUALIZE TIMING.
1309	1608		MVI	D,8	;NUMBER OF DATA BITS.

```

;***** ( SEND EACH DATA BIT ) ***** ( 39 CYCLE LOOP ) ***

```

130B	CB0B	..DATA:	RRCR	E	;ROTATE E REG RIGHT.
130D	CD 131A		CALL	BIT.OT	;SEND ONE DATA BIT.
1310	15		DCR	D	;ONE LESS BIT TO DO.
1311	C2 130B		JNZ	..DATA	;REPEAT IF MORE BITS.

```

;***** ( SEND STOP BIT ) *****

```

1314	00		NOP		;EQUALIZE TIMING.
1315	A7		ANA	A	;CLEAR CARRY FLAG.
1316	CD 131A		CALL	BIT.OT	;SEND STOP BIT.
1319	C9		RET		;RETURN TO CALLER.

```

;***** ( SET EIA BIT AND OUTPUT ) ***** ( 39 CYCLES ) *****

```

131A	DA 1322	BIT.OT:	JC	..ONE	;IF CARRY, SET TO ONE.
131D	CB9F		RES	3,A	;ZERO EIA IN ACUM REG.
131F	C3 1327		JMP	..OUT	;GO TO OUTPUT PORT.
1322	CBDF	..ONE:	SET	3,A	;SET EIA IN ACUM.
1324	C3 1327		JMP	..OUT	;EQUALIZE TIMING.
1327	D300	..OUT:	OUT	BL.CTL	;SEND ACUM TO PORT.

```

;***** ( SET DELAY FOR BAUDRATE ) *****

```

1329	0619		MVI	B,BAUD.C	;LOAD TIMING CSNT.
132B	10FE		DJNZ	.	;DELAY FOR BIT.
132D	C9		RET		;RETURN TO LST CALL.

```

;*****

```



```

;*****
; PROGRAM STORAGE LOACTIONS
;*****

132E    1380    BUF.ST: .WORD    BUF.BG    ;BUFFER STARTING ADDRESS.
1330    00      ERR.CT: .BYTE    0        ;RETRY ERROR COUNTER.

1331    00      SV.DRV: .BYTE    0        ;BL.CTL DRIVE BITS.
1332    00      SV.DAS: .BYTE    0        ;BL.CTL DRIVE AND SIDE BITS.
1333    00      SV.CTL: .BYTE    0        ;BL.CTL LAST ISSUED.
1334    00      SV.STS: .BYTE    0        ;FD179X-02 STATUS VALUE.

1335    00      PH.TRK: .BYTE    0        ;PHYSICAL TRACK NUMBER.

;*****
; TIMING VALUES - 0.1 MS INCREMENTS
;*****

1336    04B0    TM.PLD: .WORD    1200     ;PHASE LOCK RECOVERY.
1338    000A    TM.SAW: .WORD    10      ;STEP AFTER WRITING.
0018    TM.SDD  ==    24          ;SIDE SELECT DELAY.

;*****
; DISKETTE IDENTITY LABEL
;*****

133A    4A6164652044 JADEID: .ASCII  "JADE DD "    ;DISKETTE ID LABEL.
0008    ID.SIZE ==    ( . - JADEID)    ;ID LABEL SIZE.

1380    ID.LBL  ==    BUF.BG+0000H      ;ID SECTOR LABEL.
13A0    ID.BLK  ==    ID.LBL+0020H      ;ID BLOCK AREA.
13B1    ID.FLG  ==    ID.BLK+0011H      ;DISKETTE FLAGS.
0000    ID.FLD  ==    00000000B        ;3740 FLAGS.

;*****

```

```

;*****
; DRIVE TABLE AREA DEFINED
;*****

;***** ( DRIVE TABLE ENTRIES )*****

0000      DV.NBR ==      0      ;CURRENT DRIVE NUMBER.
0001      DV.TRK ==      1      ;CURRENT TRACK NUMBER.
0002      DV.FLG ==      2      ;SIDE AND DENSITY FLAGS
0003      DV.CTL ==      3      ;LAST CONTROLS USED.

;***** ( DRIVE TABLE AREA )*****

1342      DV.TBL ==      .      ;DRIVE TABLE BEGGING ADDRESS.

1342      00FF02C4      DT.DE0: .BYTE 0,255,DF.DFL,0C4H      ;DRIVE 0.
1346      01FF02C5      DT.DE1: .BYTE 1,255,DF.DFL,0C5H      ;DRIVE 1.
134A      02FF02C6      .BYTE 2,255,DF.DFL,0C6H      ;DRIVE 2.
134E      03FF02C7      .BYTE 3,255,DF.DFL,0C7H      ;DRIVE 3.
1352      04FF0000      DT.DED: .BYTE 4,255,0,0      ;DUMMY.

0004      DV.DES ==      DT.DE1-DT.DE0      ;EACH DRIVE ENTRY SIZE.

;***** ( FLAG BIT DEFINITIONS )*****

0002      DF.T1D ==      00000010B      ;TRACK 1 DENSITY (1 = DOUBLE).
0004      DF.DTD ==      00000100B      ;DATA TRACKS DENSITY (1 = DD).
0008      DF.TSD ==      00001000B      ;TWO SIDED ( 1 = TWO SIDES).
0002      DF.DFL ==      DF.T1D      ;DEFAULT FLAGS.

;*****

```

```

;*****
; THE FOLLOWING AREA IS DEFINED AS THE COMMAND BLOCK. *
; THIS AREA IS RESERVED FOR SPECIFICATION BY THE HOST *
; SYSTEM FOR ALL DISK OPERATIONS.  CONTROLLER STATUS *
; AT COMPLETION OF OPERATION IS PRESENT IN THIS AREA. *
;*****

1370          .LOC      CMD.BK  ;COMMAND BLOCK.

1370      00      CB.CMD: .BYTE  0      ;CONTROL COMMAND.
1371      00      CB.DRV: .BYTE  0      ;DRIVE NUMBER.
1372      00      CB.TRK: .BYTE  0      ;LOGICAL TRACK NUMBER.
1373      00      CB.SEC: .BYTE  0      ;SECTOR NUMBER.
1374      00      CB.FFG: .BYTE  0      ;FORMAT FLAGS.
1375      00      CB.CHR: .BYTE  0      ;EIA CHARACTER.
1376      00      CB.MOD: .BYTE  0      ;MODE SELECTS.
1377      00      CB.STS: .BYTE  0      ;CONTROLLER STATUS.

1378      0000     CW.LAD: .WORD  0      ;LOAD ADDRESS.
137A      0000     CW.LNG: .WORD  0      ;LOAD LENGTH

;***** ( MODE BIT DEFINITIONS )*****

0080      CM.NRT == 10000000B  ;NO RETRYS ( = 1 ).

;***** ( STATUS BIT DEFINITIONS )*****

0080      CS.DNR == 10000000B  ;DRIVE NOT READY.
0040      CS.WRP == 01000000B  ;WRITE PROTECTED.
0020      CS.BT5 == 00100000B  ;NOT ASSIGNED.
0010      CS.RNF == 00010000B  ;RECORD NOT FOUND.
0008      CS.CRC == 00001000B  ;CRC ERROR.
0004      CS.LDE == 00000100B  ;LOST DATA ERROR.
0002      CS.HME == 00000010B  ;DRIVE HOME ERROR.
0001      CS.TSD == 00000001B  ;TWO SIDES FLAG (FORMAT).

;*****

```

```

;*****
; THIS SECTION RESIDES IN THE DCM SECTOR BUFFER. THIS *
; SECTION MOVES DCM FROM BANK 1 DOWN TO BANK 0. THE *
; C REGISTER IS SET FOR 1791-01 OR 1793-01. THE LAST *
; OPERATION IS TO READ THE BIOS LOADER SECTOR TO *
; OVERLAY THIS INITIALIZATION SEQUENCE. BIOS LOADER *
; THEN READ BIOS INTO BANK 1 AND HALTS. *
;*****

```

```

;***** ( EXECUTES IN BANK 1 )*****

```

```

1380          .LOC      BUF.BG          ;RESIDES IN BUFFER.
1380      01 0400      INIT.B: LXI      B,BANK.L      ;SET BANK LENGTH.
1383      11 1000      LXI      D,BANK.O      ;SET DESTINATION.
1386      21 1400      LXI      H,BANK.1      ;SET SOURCE ADDR.
1389      ED00          LDIR          ;MOVE BLOCK.
138B      C3 138E      JMP      ..DOWN      ;JUMP TO NEW IMAGE.

```

```

;***** ( NOW IN BANK 0, SET INT MODE )*****

```

```

138E      31 1370      ..DOWN: LXI      SP,TP.STK      ;SET STACK PNTR.
1391      ED56          IM1          ;INTERRUPT MODE 1.

```

```

;***** ( SET 1791-01/1793-01 )*****

```

```

1393          MVI      C,0          ;LOAD C REG ZERO.
1395          IN      BL,STS      ;BOARD STATUS.
1397          ANI      BS.US0      ;TEST USER SW #1.
1399          JRNZ     LD.BLT      ;SW OPEN - 1793.
139B          MVI      C,0FFH      ;SW CLOSED - 1791.

```

```

;***** ( OVERLAY WITH BIOS LOADER TRANSIENT )*****

```

```

139D      DD21 1352      LD.BLT: LXI      X,DT.DED      ;INIT DRIVE TBL.
13A1          MVI      A,2          ;BIOS LOADER SECTOR.
13A3          STA      CB.SEC      ;SET SECTOR VALUE.
13A6          IN      XP.MTX      ;MOTOR TIME EXTEND.
13A8          LXI      H,BUF.BG      ;SET RETURN ADDR.
13AB          PUSH     H          ;PUSH INTO STACK.
13AC          JMP      RD.SEC      ;GET BIOS LOADER.

```

```

;*****

```

```

.END

```

DISK CONTROLLER MODULE (DCM2)

+++++ SYMBOL TABLE +++++

BANK.0 1000	BANK.1 1400	BANK.L 0400	BASE 1000
BAUD.C 0019	BC.DAS 0020	BC.DDE 0010	BC.DDS 0010
BC.DSA 0001	BC.DSB 0002	BC.DSE 0004	BC.DSN 0003
BC.EIA 0008	BC.INW 0020	BC.PCA 0040	BC.PCB 0080
BC.FCH 0040	BC.PCL 00C0	BC.PCM 0080	BC.SD1 0020
BC.SDS 0000	BIT.OT 131A	BL.CTL 0000	BL.STS 0000
BS.DCN 0080	BS.EIA 0010	BS.INT 0008	BS.MOF 0020
BS.TSD 0040	BS.TST 0004	BS.US0 0001	BS.US1 0002
BUF.BG 1380	BUF.ST 132E	CB.CHR 1375	CB.CMD 1370
CB.DRV 1371	CB.FFG 1374	CB.MOD 1376	CB.SEC 1373
CB.STS 1377	CB.TRK 1372	CHK.RT 1279	CMD.BK 1370
CM.DTA 1053	CM.MSK 0007	CM.NRT 0080	CS.BTS 0020
CS.CRC 0008	CS.DNR 0080	CS.HME 0002	CS.LDE 0004
CS.RNF 0010	CS.TSD 0001	CS.WRP 0040	CW.LAD 1378
CW.LNG 137A	DC.HDL 0018	DC.HDU 0010	DC.IFI 00D8
DC.RDA 00C0	DC.RDS 0088	DC.STS 00D0	DC.WRS 00A8
DC.WRT 00F0	DF.DFL 0002	DF.DTD 0004	DF.T1D 0002
DF.TSD 0008	DM.DNR 0080	DM.FER 00E4	DM.HDL 0020
DM.LDE 0004	DM.RER 009D	DM.TKO 0004	DM.WER 00FD
DT.DE0 1342	DT.DE1 1346	DT.DED 1352	DV.CTL 0003
DV.DES 0004	DV.FLG 0002	DV.NBR 0000	DV.TBL 1342
DV.TRK 0001	ERR.CT 1330	EX.HCF 1018	EX.STS 1024
FETCH 103F	FMT.BG 1700	FMT.PS 1708	HOME.D 12A6
HR.INT 1038	HR.VEC 1006	ID.BLK 13A0	ID.FLD 0000
ID.FLG 13B1	ID.LBL 1380	ID.SZE 0008	INIT.B 1380
ID.BLK 1370	JADEID 133A	LD.BLT 139D	LOG.ON 12D7
LST.OT 12F4	NM.INT 1066	PH.TRK 1335	RD.SEC 1204
RST.0 1000	RST.1 1008	RST.2 1010	RST.3 1018
RST.4 1020	RST.5 1028	RST.6 1030	RST.7 1038
RTY.LS 0009	RTY.SK 0005	SEEK 1131	SELECT 10EF
SV.CTL 1333	SV.DAS 1332	SV.DRV 1331	SV.STS 1334
TICK.E 1074	TICK.R 1070	TMR.FC 0019	TMR.NC 001C
TM.ALS 1014	TM.HLD 1010	TM.MTO 1016	TM.PLD 1336
TM.SAW 1338	TM.SDD 0018	TM.STP 1012	TP.STK 1370
TRK.IB 0034	TRK.OB 001A	WD.CMD 0004	WD.DTA 0007
WD.INT 1066	WD.SEC 0006	WD.STS 0004	WD.TRK 0005
WR.SEC 122F	WR.TRK 125A	XP.DSH 0080	XP.IRR 0020
XP.MTO 0010	XP.MTX 0040	XP.STP 0008	X.CUTE 1041
\$.ADDR 10C7	\$.FORM 1098	\$.IDLE 10E4	\$.LGON 10AC
\$.LIST 10CF	\$.LSTT 10D5	\$.READ 107C	\$.WRIT 108A

F1000,13FF,0

-IDCM2.HEX

-R

NEXT PC

13AF 0000

-D1000,12FF

```
1000 C3 00 00 C3 80 17 41 10 06 19 10 FE C3 74 10 00 .....A.....T..
1010 5E 01 50 00 50 00 01 00 FD E1 DB 05 D3 07 78 A9 ^.P.P.....X.
1020 D3 04 18 FE 3E D0 A9 D3 04 E3 E3 E3 E3 DB 04 A9 .....>.....
1030 C9 00 00 00 00 00 00 00 DB 20 D1 2A 06 10 E9 FB .....*. ....
1040 76 3A 70 13 E6 07 87 16 00 5F 21 53 10 19 5E 23 V:P....._!S..^#
1050 56 EB E9 AC 10 7C 10 8A 10 98 10 C7 10 CF 10 D5 V.....\.....
1060 10 E4 10 00 00 00 00 DB 04 A9 32 34 13 FD E3 ED 45 .....24....E
1070 06 1C 10 FE 1B 7A B3 00 00 20 F5 C9 CD EF 10 CD .....Z.....
1080 31 11 20 03 CD 04 12 C3 3F 10 CD EF 10 CD 31 11 1. ....?.....1.
1090 20 03 CD 2F 12 C3 3F 10 CD EF 10 3A 73 13 DD 77 ../...?....:S..W
10A0 02 CD 31 11 20 03 CD 5A 12 C3 3F 10 CD EF 10 AF ..1. ...Z...?.....
10B0 32 72 13 3C 32 73 13 CD 31 11 20 08 CD 04 12 20 2R.<2S..1. ....
10C0 03 CD D7 12 C3 3F 10 3E FF 32 77 13 C3 3F 10 CD .....?..>.2W..?..
10D0 F4 12 C3 3F 10 DB 00 E6 10 CA DE 10 3E FF 32 77 ...?.....>.2W
10E0 13 C3 3F 10 DB 00 E6 08 28 FA DB 20 C3 3F 10 DB ..?.....(... ?..
10F0 00 E6 20 DB 40 28 05 ED 5B 16 10 CF 3A 71 13 E6 .. .@([...:Q..
1100 03 DD BE 00 C8 DD 21 42 13 11 04 00 3D FA 14 11 .....!B.....=...
1110 DD 19 18 F8 06 10 CD 18 10 3A 33 13 E6 FB D3 00 .....:3.....
1120 E6 FC DD B6 00 D3 00 F6 04 D3 00 E6 07 32 31 13 .....21.
1130 C9 CD 24 10 E6 A0 FA 74 11 C2 46 11 06 18 CD 18 ..$. ....T..F.....
1140 10 ED 5B 10 10 CF DB 00 E6 40 3A 72 13 6F C2 52 ..[.....@:R.O.R
1150 11 1F 32 35 13 67 3A 31 13 30 02 F6 20 32 32 13 ..25.G:1.0.. 22.
1160 57 7C DD 96 01 20 21 DB 00 E6 40 CA 7B 11 DD 7E W\... !...@.[...^
1170 03 C3 EA 11 3E 80 32 77 13 A7 C9 7C A7 28 3B DD .....>.2W....\.(;
1180 7E 03 E6 DF B2 C3 EA 11 F5 ED 5B 38 13 CF F1 38 ^.....[8...8
1190 0A 6F 3A 31 13 F6 20 D3 00 18 0B ED 44 FA FD 11 .0:1.. ....D...
11A0 6F 3A 31 13 D3 00 DB 08 ED 5B 12 10 CF 2D 20 F6 0:1.....[....- .
11B0 3A 32 13 D3 00 ED 5B 14 10 CF 3A 72 13 FE 01 38 :2....[...:R...8
11C0 20 3E 04 C2 C8 11 3E 02 DD A6 02 CA E1 11 3A 35 >.....>.....:5
11D0 13 FE 1A 06 D0 38 0C FE 34 06 90 38 06 06 50 18 .....8..4..8..P.
11E0 02 06 C0 3A 32 13 B0 DD 77 03 D3 00 32 33 13 3A ...:2...W...23.:
11F0 35 13 DD 77 01 3A 72 13 A9 D3 05 AF C9 CD A6 12 5..W.:R.....
1200 C0 C3 46 11 AF 32 30 13 3A 73 13 A9 D3 06 FD 21 ..F..20.:S.....!
1210 23 12 2A 2E 13 3E 88 A9 D3 04 DB 80 DB 07 A9 77 #.*..>.....W
1220 23 18 F7 E6 9D 32 77 13 C8 CD 79 12 28 E0 C9 AF #....2W...Y.(...
1230 32 30 13 3A 73 13 A9 D3 06 FD 21 4E 12 2A 2E 13 20.:S.....!N.*..
1240 3E A8 A9 D3 04 DB 80 7E A9 D3 07 23 18 F7 E6 FD >.....^...#....
1250 32 77 13 C8 CD 79 12 28 E0 C9 FD 21 66 12 3E F0 2W...Y.(...!F.>.
1260 A9 D3 04 C3 08 17 E6 E4 47 DB 00 E6 40 78 20 02 .....G...@X .
1270 F6 01 32 77 13 22 7A 13 C9 E6 80 20 28 3A 76 13 ..2W."Z.... (:V.
1280 E6 80 20 21 DB 40 3A 30 13 3C 32 30 13 FE 05 20 .. !.@:0.<20...
1290 08 CD A6 12 20 0F CD 31 11 FE 09 28 07 ED 5B 36 .... .1....([6
12A0 13 CF AF C9 3C C9 3A 31 13 D3 00 32 33 13 2E FF ....<.:1...23...
12B0 CD 24 10 E6 04 20 0C 2D 28 16 DB 08 ED 5B 12 10 $. ....-([....[...
12C0 CF 18 ED ED 5B 14 10 CF 79 D3 05 AF DD 77 01 C9 ....[...Y.....W..
12D0 3E 02 32 77 13 A7 C9 11 3A 13 21 80 13 06 08 1A >.2W....:!. ....
12E0 BE 20 0B 13 23 10 F8 3A B1 13 DD 77 02 C9 3E 00 . ...#.....W..>.
12F0 DD 77 02 C9 DB 00 E6 10 CA F4 12 3A 75 13 2F 5F .W.....:U./_-
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D1300,13FF

```
1300 3A 33 13 37 CD 1A 13 00 00 16 08 CB 0B CD 1A 13 :3.7.....
1310 15 C2 0B 13 00 A7 CD 1A 13 C9 DA 22 13 CB 9F C3 .....".
1320 27 13 CB DF C3 27 13 D3 00 06 19 10 FE C9 80 13 <.....<.....
1330 00 00 00 00 00 00 B0 04 0A 00 4A 61 64 65 20 44 .....JADE D
1340 44 20 00 FF 02 C4 01 FF 02 C5 02 FF 02 C6 03 FF D .....
1350 02 C7 04 FF 00 00 00 00 00 00 00 00 00 00 00 00 .....
1360 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
1370 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
1380 01 00 04 11 00 10 21 00 14 ED B0 C3 8E 13 31 70 .....!.....1P
1390 13 ED 56 0E 00 DB 00 E6 01 20 02 0E FF DD 21 52 ..V.....!R
13A0 13 3E 02 32 73 13 DB 40 21 80 13 E5 C3 04 12 00 .>.2S..@!.....
13B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
13C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
13D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
13E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
13F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
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